THE PHYSIOLOGY OF DECIDUOUS FRUITS
IN STORAGE

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INTRODUCTION

The various deciduous fruits like apples, pears, peaches and plums are living organisms, even after being separated from the parent tree at harvest time. This means that these fruits carry on physiological processes like respiration and transpiration during storage. Of course, they finally "die", and it is the job of the owner of the fruit to dispose of them long before death is reached. Just when an apple is "dead" is not easily discernible. It is true that parasitic fungi are often the cause of death, but very often old age is the cause of the "demise".

It is the obligation of the storage operator to so manipulate conditions in storage that the longest possible life of the fruit may be expected. That means he must provide conditions for controlled respiration, transpiration and possibly other physiological processes. It is the obligation of the plant physiologist to tell the storage operator what the optimum conditions for storage are.

This review purports to summarize the available information on the physiology of fruits and how it may be controlled in storage. The behavior of fruit in storage is often strongly affected by conditions in the orchard during the growing season or by the handling of the fruit by the owner after harvest. Since these pre-storage factors have a bearing on storage behavior, they will be dealt with whenever they seem pertinent.

TRANSPERSION

All deciduous fruits should reach the consumer while they are still crisp and juicy. Most of these fruits are 85% or more water, and even a comparatively small loss in total water content means an appreciable reduction in eating quality. By the time an apple fruit has lost 5% of its original weight, it is shrivelled enough that it not only has reduced eating quality but is unattractive because of the wrinkled appearance of the skin.
Effect of Time of Harvest. It has been a common observation that deciduous fruits picked in a rather immature condition shrivel more in storage than fruits picked at the proper time. For example, if Golden Delicious apples are examined in storage on February first, the fruits that were harvested on September first will show more wilting than fruits harvested October first. Because of this observation it has been assumed that early picked fruits transpire faster in storage than more mature ones.

Recent work (150) throws light on this subject with reference to apples. Whether these findings will be corroborated by other deciduous fruits remains to be seen. It was found that the rate of transpiration of apples does tend to be very high early in the growing season, but as the season progresses the transpiration rate decreases until about the normal time for harvest. The transpiration rates of several varieties of apples were found to reach their minimum shortly before the time for optimum picking maturity. After this point was reached, the apples transpired at a faster rate, especially when allowed to become over-mature on the tree. Hence it seems apparent that late picked fruits may actually transpire at a faster rate than earlier picked fruits in storage.

The fact that Golden Delicious apples examined on February first show more shrivelling if harvested early may be explained in the following ways. First, they are in storage a month longer, so it is no great wonder that the total water loss is greater. Second, during the early storage period in most cold storages, the relative humidity is likely to be rather low. This low humidity may be due to the very low refrigerant temperatures employed. It might also be due to the drying effect of the wooden containers until the vapor pressure of the wood comes to equilibrium with that of the air. Third, the temperature of these storages and of the fruit is often not so low as it is later in the season when the second lot of Golden Delicious is placed in storage.

The respiration rate of apples and pears varies with the age of the fruit, but no correlation was found between respiration rate and transpiration rate (149). As fruits grow old the rate of transpiration eventually diminishes. This is probably due to differences in the physical structure of the skin and to internal factors (170).

Effect of Fruit Size. Since transpiration is a surface phenomenon it is not surprising that a bushel of small apples will transpire